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6. AUTHORS
Kamal S. Ali

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES
Jackson State University
1400 John R. Lynch Street

Jackson, MS 39217 -0129

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The views, opinions and/or findings contained in this report are those of the author(s) and should not contrued as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT
In this research a HILS system in which a small autopilot can experience flight stimuli, such as pitch, roll, yaw, and GPS is investigated. These stimuli are controlled by a flight simulator hosting an airframe model that the autopilot in question fly's. Such a system allows the autopilot to fly the virtual model of the flight simulator while experiencing all flight stimuli as if it is in real flight.

15. SUBJECT TERMS
HILS System, UAV, MAV, Autopilot, IMU, Simulation, Flight Simulation

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Kamal Ali
UU	UU	UU	UU		19b. TELEPHONE NUMBER 601-979-1183

Report Title

Final Report: A HILS System for the Simulation of MAV Flight

ABSTRACT

In this research a HILS system in which a small autopilot can experience flight stimuli, such as pitch, roll, yaw, and GPS is investigated. These stimuli are controlled by a flight simulator hosting an airframe model that the autopilot in question fly's. Such a system allows the autopilot to fly the virtual model of the flight simulator while experiencing all flight stimuli as if it is in real flight.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received	Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received	Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received	Paper	
07/25/2013	1.00	Kamal Ali, Justin Shumaker. Hardware in the loop simulator for multi agent unmanned aerial vehicles environment. , Amercian Journal of Engineering and Applied Science (05 2013)

TOTAL: **1**

Number of Manuscripts:

Books

Received Book

TOTAL:

Received Book Chapter

TOTAL:

Patents Submitted

A HILS system for autopilot calibration and simulation. Kamal S. Ali and Justin Shumaker, Joint patent with ARL/VTD. Patent number (8,566,071).

Patents Awarded

A HILS system for autopilot calibration and simulation. Kamal S. Ali and Justin Shumaker, Joint patent with ARL/VTD. Patent number (8,566,071).

Awards

Graduate Students

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Post Doctorates

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Faculty Supported

NAME	PERCENT_SUPPORTED	National Academy Member
Kamal S. Ali	0.30	
Mahmoud A. Manzoul	0.10	
Abdelnasser Eldek	0.10	
FTE Equivalent:	**0.50**	
Total Number:	**3**	

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED	Discipline
William Munn	0.50	
Mathiew Byer	0.50	
FTE Equivalent:	**1.00**	
Total Number:	**2**	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:..... 0.00

Names of Personnel receiving masters degrees

NAME
Total Number:

Names of personnel receiving PHDs

NAME
Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

Many minor modifications were made to render the HILS system more operable. Two copies of the platform were built. One delivered to the Air Force Research Labs at Eglin AFB.

Technology Transfer

A copy of the HILS system was delivered to AFRL at Eglin Air Force Base, Fort Walton Beach, FL. The unit was transferred and its operation demonstrated using a Jackson State GPS Spoofer. The unit was delivered without the GPS Spoofer. The POC at Eglin AFB/AFRL is:

Nick Newsted
Munitions Aerodynamics Sciences Branch
Research Computer Engineer
Unit Frequency Manager
(DSN) 875-2706
(D) 850-883-2706
(C) 727-742-7535